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**Declaration under Rule 4.17:**

— of inventorship (Rule 4.17(iv)) for US only

**Published:**

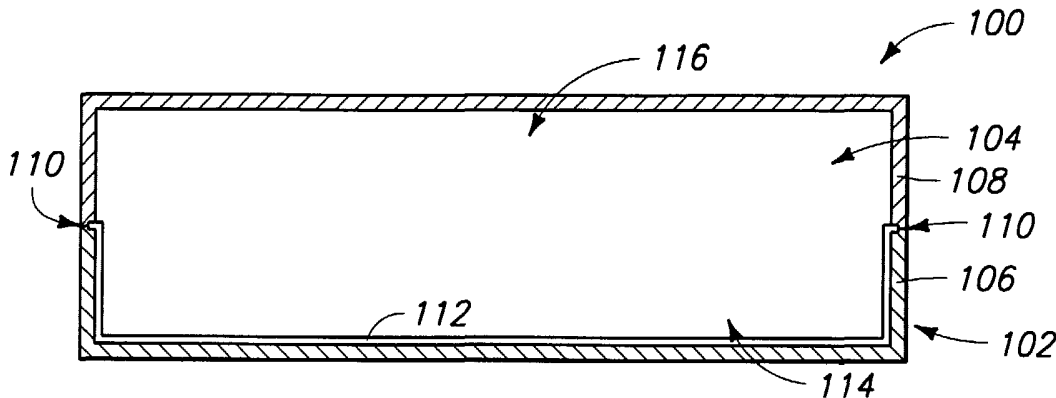
— with international search report

**(88) Date of publication of the international search report:**

4 September 2003

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: THERMAL TRANSFER DEVICES USING HEAT PIPES



(57) Abstract: The invention includes a thermal transfer device. The device includes a housing which defines at least part of chamber sealed from the atmosphere, and a working fluid contained within the chamber. The housing can be formed of a composition which includes a polymer base matrix having a thermally conductive filler material dispersed therein. The housing can have a thermal conductivity of at least about 10 W/mK. The device can include a wick comprising woven carbon fibers.



WO 03/017365 A3

**INTERNATIONAL SEARCH REPORT**

Int. onal Application No  
PCT/US 01/25769

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 H01L23/427 H01L23/373

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)  
EPO-Internal, PAJ, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	<p>WO 99 26286 A (AMOCO CORP ;MILLER JAMES D (US); LEVESQUE KEVIN J (US)) 27 May 1999 (1999-05-27) abstract</p> <p>page 1, line 7 - line 10 page 4, line 22 -page 5, line 15 page 8, line 1 - line 3 page 9, line 26 -page 10, line 20 page 10, line 2 - line 24 page 17, line 17 - line 19 table 2</p> <p align="center">--- -/--</p>	<p>1-6, 10-19, 23-26 7-9, 20-22, 28, 31-35, 40-42</p>

Further documents are listed in the continuation of box C.       Patent family members are listed in annex.

° Special categories of cited documents :

*A* document defining the general state of the art which is not considered to be of particular relevance	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
*E* earlier document but published on or after the international filing date	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
*O* document referring to an oral disclosure, use, exhibition or other means	*&* document member of the same patent family
*P* document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search  19 March 2003	Date of mailing of the international search report  28/03/2003
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## INTERNATIONAL SEARCH REPORT

 International Application No  
 PCT/US 01/25769

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 86 04982 A (FUJIKURA LTD)	27, 29, 30
	28 August 1986 (1986-08-28)	
Y	abstract; figures 1, 2, 7, 8	7-9,
		20-22,
		28,
		31-35,
		40-42
A		36-39
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A	US 5 076 352 A (ROSENFELD JOHN H ET AL)	1, 7, 16,
	31 December 1991 (1991-12-31)	20, 27, 31
	the whole document	
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A	PATENT ABSTRACTS OF JAPAN	14, 15
	vol. 013, no. 068 (E-716),	
	16 February 1989 (1989-02-16)	
	& JP 63 254755 A (MITSUBISHI ELECTRIC	
	CORP), 21 October 1988 (1988-10-21)	
	abstract	
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A	EP 0 295 916 A (TAKEMOTO OIL & FAT CO LTD)	29, 42
	21 December 1988 (1988-12-21)	
	page 4, line 37 - line 42	
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# INTERNATIONAL SEARCH REPORT

national application No.  
PCT/US 01/25769

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1.  As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3.  As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-26

A thermal transfer device comprising a housing, said housing being formed of a polymer base matrix having thermally conductive filler material dispersed therein and said housing having a thermal conductivity of at least 10W/mK, and the thermal transfer device further comprising a working fluid within a chamber.

2. Claims: 27-30

A thermal transfer device comprising a housing, a working fluid contained within a chamber and a wick within the housing, said wick comprising woven carbon fibers.

3. Claims: 31-42

A thermal transfer device comprising a housing, said housing comprising a material having a coefficient of thermal expansion of less than 12ppm/C, the thermal transfer device further comprising a working fluid contained within a chamber and a wick within the housing.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No  
PCT/US 01/25769

Patent document cited in search report	A	Publication date	Patent family member(s)	Publication date
WO 9926286	A	27-05-1999	CA 2309630 A1 EP 1029352 A1 JP 2001523892 T WO 9926286 A1	27-05-1999 23-08-2000 27-11-2001 27-05-1999
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